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## ALGEBRA.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

### SOLUTIONS OF PROBLEMS.

58. Proposed by D. G. DORRANCE, Jr., Camden, Oneida County, New York.

Sum the series 1, 1, 1, 2, 3, 4, 6, 9, 13, 19, etc., to  $n$  terms; also what is the  $n^{\text{th}}$  term?

Solution by COOPER D. SCHMITT, A. M., Professor of Mathematics, University of Tennessee, Knoxville, Tennessee, and Prof. P. S. BERG, Larimore, North Dakota.

The series is evidently made up as follows from the different rows in Pascal's Triangle, beginning three farther to the right every time; thus,

a.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	.....	
b.				1	2	3	4	5	6	7	8	9	10	11	12	13	.....
c.							1	3	6	10	15	21	28	36	45	55	
d.										1	4	10	20	35	56	84	
e.														1	5	15	35
f.																	1
<hr/>																	
	1,	1,	1,	2,	3,	4	6,	9,	13,	19,	28,	41,	60,	88,	129,	189,	etc.

The  $n^{\text{th}}$  term of (a) is 1; the  $(n-3)^{\text{th}}$  term of (b) is  $n-3$ ; the  $(n-6)^{\text{th}}$  term of (c) is  $\frac{(n-5)(n-6)}{2}$ ; the  $(n-9)^{\text{th}}$  term of (d) is  $\frac{(n-7)(n-8)(n-9)}{3}$ ; and the  $(n-12)^{\text{th}}$  term of (e) is  $\frac{(n-9)(n-10)(n-11)(n-12)}{4}$ ; and so on. Hence the  $n^{\text{th}}$

term of the original series is composed of the sum of the above different terms; i. e.

$$1 + (n-3) + \frac{(n-5)(n-6)}{2} + \frac{(n-7)(n-8)(n-9)}{3} + \frac{(n-9)(n-10)(n-11)(n-12)}{4}$$

+ ..... Also, the sum of  $n$  terms of (a) is  $n$ ; of  $(n-3)$  terms of (b) is

$$\frac{(n-3)(n-2)}{2}; \text{ of } (n-6) \text{ terms of (c) is } \frac{(n-6)(n-5)(n-4)}{3}; \text{ and the sum of}$$

$$(n-9) \text{ terms of (d) is } \frac{(n-9)(n-8)(n-7)(n-6)}{4} \text{ ..... and hence } S = n +$$

$$\frac{(n-3)(n-2)}{2} + \frac{(n-6)(n-5)(n-4)}{3} + \frac{(n-9)(n-8)(n-7)(n-6)}{4} + \text{.....}$$

Also solved by B. F. YANNEY and G. B. M. ZERR.